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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,000	02/01/2006	Kwang-jin Lee	NEK-0012	9626
23413 7590 10/16/2008 CANTOR COLBURN, LLP 20 Church Street 22nd Floor Hartford, CT 06103				
EXAMINER LENIHAN, JEFFREY S				
ART UNIT		PAPER NUMBER		
1796				
NOTIFICATION DATE		DELIVERY MODE		
10/16/2008		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

usptopatentmail@cantorcolburn.com

## Office Action Summary

**Application No.**

10/567,000

**Applicant(s)**

LEE ET AL.

**Examiner**

Jeffrey Lenihan

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)
- Paper No(s)/Mail Date 6/12/2006
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Specification*

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of **50 to 150 words** (emphasis added). It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-17, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn et al, WO 2004/058839, in view of Miyatake et al, US5804655.

5. Ahn discloses an impact modifier having a multi-layer structure comprising 0.5-40 parts by weight, based on the weight of the total composition, of a seed comprising a copolymer of vinyl monomers and hydrophilic monomers; 50-89.5 parts by weight of a rubbery core containing alkyl acrylate monomers surrounding the seed; and 10-49.5 parts by weight of a shell containing C<sub>1</sub>-C<sub>4</sub> alkyl methacrylate (claim 12) surrounding the rubbery core (Page 2, line 21 to Page 3, line 18) (claims 1 and 16). Said seed is prepared from 65-99.4 parts by weight vinyl monomer such as styrene (Page 8, lines 7-9) (claims 3), 0.5-30 parts by weight hydrophilic monomer such as acrylonitrile (Page 8, lines 10-15) (claim 4), and 0.1-5 parts by weight cross-linking monomer such as divinylbenzene (Page 8, lines 16-22) (claim 11) via a cross-linking reaction by emulsion polymerization (Page 3, line 22 to Page 4, line 6) (claims 2 and 16). Said rubbery core comprises 95-99.9 parts by weight C<sub>2</sub>-C<sub>8</sub> alkyl acrylate, such as butyl acrylate, and 0.1-5.0 parts by weight of a cross-linking monomer such as 3-butanediol diacrylate (Page 9, lines 1 to Page 10, line 23) (claims 6, 7, and 21) and is prepared by emulsion polymerization (claim 16). Said shell may further comprise 0.5-10 parts by weight of a comonomer such as acrylonitrile (Page 12, lines 8-18) (claim 13) and is formed via emulsion graft polymerization (Page 4, lines 16-23) (claim 16). Ahn further discloses a thermoplastic resin composition comprising 80-99.5 parts by weight thermoplastic resin, such as polyvinyl chloride (PVC), and 0.5-20 parts by weight of the impact modifier (Page 13, line 22 to page 14, line 5) (claim 20).

6. Ahn further teaches that the impact modifiers may be obtained via coagulation via addition of hydrochloric acid at a temperature greater than 90 °C (Page 13, lines 12-17) (claim 17),
7. Ahn does not disclose the use of an acryl-silicone hybrid core in the multi-layer impact modifier of WO 2004/058839.
8. Miyatake discloses a silicone-modified acrylic rubber particles, prepared by graft-polymerizing 45-5000 parts by weight siloxane rubber onto 100 parts by weight acrylic rubber particles (abstract) (claims 5 and 16), which are capable of improving the impact resistance of thermoplastic resins (abstract) such as PVC (Column 4, lines 54-56). Said acrylic rubber particles may comprise 65-99.9% of a C<sub>1</sub>-C<sub>12</sub> alkyl acrylate (A-1), preferably butyl acrylate, and 0-5% of a polyfunctional monomer (A-2) utilized as a cross-linking agent (Column 5, lines 11-33 and Column 5, line 61 to Column 6, line 12) (claims 6, 7, and 16). Said siloxane rubber comprises 80-99.9% of an organosiloxane such as hexamethylcyclotrisiloxane (B-1) (claims 8, 9, and 16), 0.1-10% of a cross-linking agent (B-2) such as tetramethoxysilane (claims 8, 10, and 16), and 0-10% of a graft-linking agent (B-3) such as  $\beta$ -methacryloyloxyethyltrimethoxymethylsilane (claims 8 and 16). As the glass transition temperatures of butyl acrylate and polydimethoxysilanes are known to be approximately -54 °C and -120 °C, respectively, the glass transition temperature of the silicone-modified acrylic copolymers would be expected to fall within the range of -120 °C to 25 °C as recited in the instant claims (claim 14).

9. The acrylic rubber particles further comprise an alkoxyisilane monomer which is utilized to provide a point of chemical attachment between the acrylic rubber particle and the silicone rubber polymerized at its surface (Column 6, lines 35-67) as well as cross-linking with the polyfunctional monomer (A-2) (Column 9, lines 7-18). The examiner therefore takes the position that a polyorganosiloxane phase is present both on the outer surface and dispersed within the acrylic rubber particles of the Miyatake (claim 15). Miyatake teaches that the silicone rubber is graft-polymerized onto the acrylic rubber particles via condensation under acidic conditions (Column 7, lines 39-48, Column 9, lines 19-24) at temperatures such as 60-65 °C (Column 22, lines 17-27) (claim 16). The modification of the acrylic rubber with a grafted silicone rubber results in an impact modifier which provides good weather resistance and improved impact resistance to a thermoplastic resin (Column 2, lines 63-67).

10. Both Ahn and Miyatake are directed towards the development of impact modifiers for use in thermoplastic resins such as PVC. The examiner therefore takes the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the impact modifier disclosed by Ahn by grafting an silicone rubber layer onto the acrylic rubber core, as taught by Miyatake, to develop an impact modifier comprising a seed/core/core/shell structure as described in the instant claims. Said modification would result in an impact modifier capable of conferring improved weather resistance to a thermoplastic resin.

11. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ahn et al, WO 2004/058839, and Miyatake et al, US5804655 as applied to claim 16 above, and further in view of Hamilton et al, US6730734 and Goldman et al, US4278576 .

12. As noted previously, the combination of Ahn and Miyatake renders obvious a process for producing an impact modifier comprising the steps of forming a seed latex, forming an acrylic rubber core, forming a silicone rubber core, and grafting a final shell. Miyatake teaches the addition of sodium alkyl sulfates as an emulsifying agent in the production of impact modifiers via emulsion polymerization (Column 7, lines 53-67). Neither Ahn nor Miyatake teaches the use of spray drying during the processing of the final impact modifier or flow aids.

13. Spray drying is known in the art as an economical and desirable means of producing core/shell polymers in a particulate, free-flowing form. Hamilton is directed towards the production of an impact modifier composition which has the dual effects of enhancing the impact strength properties and decreasing the melt viscosity of plastic resins (Column 2, lines 31-35) using any known impact modifier (Column 3, line 61 to Column 4, line 13). Said impact modifier composition may be prepared by emulsion polymerization, followed by spray drying (Column 2, lines 51-54) under the conditions of an inlet temperature of 150 °C, outlet temperature of 55 °C, and rotor speed of approximately 40,000 rpm (Column 10, lines 10-21) (claim 18) to obtain a powder. As it is known in the art that the size of the particles resulting from spray drying is dependent in part on the rotor speed, it would have been obvious to one of ordinary skill in the art

to optimize the rotor speed through routine experimentation to obtain impact modifier particles of the desired size.

14. As taught by Goldman, stearate-coated calcium carbonate (claim 19) may be used as a flow aid in the isolation of impact modifiers (abstract) by spray drying (Column 2, lines 37-38). Goldman discloses that stearate-coated calcium carbonate may be added at higher levels than other flow aids, further improving the flow characteristics of the resulting powder (Column 1, line 54 to Column 2, line 4).

15. Ahn, Miyatake, Hamilton, and Goldman are all directed towards the production of impact modifiers. The examiner therefore takes the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Ahn to isolate the impact modifier via a process of spray drying, as taught by Hamilton, using a stearate-coated calcium carbonate flow aid, as taught by Goldman, to develop an economical method of producing an impact modifier powder having improved flow characteristics.

16. Claims 1-17, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji et al, US5298559, in view of Miyatake et al, US5804655.

17. Fuji discloses a multi-layered polymer comprising 12-42% by weight of a core layer of an aromatic vinyl polymer, 48-78% by weight of an intermediate butadienic rubber layer, and 10-40% by weight of an outer layer polymer (abstract) (claims 1 and 16). The examiner notes that, based on the stated values, the impact modifier of the instant claims comprises 0.007-13.2% by weight seed latex, 54.5-94% by weight acryl-



silicone core, and 5.5-405 by weight shell layer. Fuji states that the core layer may comprise preferably 20% by weight or less of a non-aromatic monomer such as ethyl acrylate (claims 1, 2, 4, and 16) and 5-15% by weight of a cross-linking monomer such as divinylbenzene (claims 11 and 16), and an aromatic monomer such as styrene (claims 2, 3, and 16) (Column 3, line 45 to Column 4, line 4). Said butadienic rubber layer comprises butadiene, a copolymerizable monomer such as butyl acrylate, and a cross-linking monomer such as butadiene (claim 21) (Column 4, lines 17-57). Said outer layer polymer may be prepared from an aromatic vinyl monomer and a non-aromatic monomer such as methyl methacrylate (claims 12 and 16); monomers such as acrylonitrile may also be included at levels of less than 45% by weight (Column 4, line 58 to Column 5, line 10) (claim 13). Fuji recites that the multi-layer polymer is synthesized via continuous multi-stage emulsion polymerization (Column 3, lines 33-37) (claim 16) and may be isolated by salting out followed by drying (Column 6, lines 10-21) (claim 17).

18. Fuji does not disclose the use of an acryl-silicone hybrid core in the multi-layer impact modifier of US5298559.

19. As noted in paragraphs 8-9 of this Office Action, Miyatake discloses silicone-modified acrylic rubber particles, having  $T_g$  within the range of -120 to 25 °C (claim 14), which are prepared by graft-polymerizing 45-5000 parts by weight siloxane rubber onto 100 parts by weight acrylic rubber particles (claims 5 and 16). As discussed previously, the examiner takes the position that said grafting, which is performed under acidic conditions at temperatures such as 60-65 °C (claim 16), results in a polyorganosiloxane

phase that is present both on the outer surface of and dispersed within the acrylic copolymer (claim 15). Said acrylic rubber particles may comprise 65-99.9% butyl acrylate and 0-5% of a cross-linking agent (claims 6, 7, and 16) and said siloxane rubber may comprise 80-99.9% hexamethylcyclotrisiloxane (claims 8, 9, and 16), 0.1-10% tetramethoxysilane (claims 8, 10, and 16), and 0-10%  $\beta$ -methacryloyloxyethyltrimethoxymethylsilane (claims 8 and 16). The impact modifiers are isolated via coagulation with a metal salt, followed by filtration (Column 14, lines 53-61) (claim 17). Miyatake teaches the use of said particles to improve the impact resistance of thermoplastic resins such as PVC and polycarbonate resins (claim 20).

20. Both Fuji and Miyatake are directed towards the development of impact modifiers for use in thermoplastic resins. The examiner therefore takes the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to alter the impact modifier disclosed by Fuji by modifying the butadienic rubber layer into an acryl-silicone rubber composition, as described by Miyatake, to develop an impact modifier comprising a seed/core/core/shell structure as described in the instant claims. Said modification would result in an impact modifier capable of conferring improved weather resistance to a thermoplastic resin such as polycarbonate or PVC.

21. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fuji et al, US5298559, and Miyatake et al, US5804655 as applied to claim 16 above, and further in view of Hamilton et al, US6730734 and Goldman et al, US4278576 .

22. As noted previously, the combination of Fuji and Miyatake renders obvious a process for producing an impact modifier comprising the steps of forming a seed latex, forming an acrylic rubber core, forming a silicone rubber core, and grafting a final shell. Miyatake teaches the addition of sodium alkyl sulfates as an emulsifying agent in the production of impact modifiers via emulsion polymerization (claim 18). Fuji teaches the use of spray drying in the isolation of the multi-layered polymer (Column 6, lines 10-21) (claim 18). Neither Fuji nor Miyatake teaches the use of flow aids or the recited temperature and rotor speed values.

23. As noted in paragraphs 13-14 of this Office Action, Hamilton teaches the production of an impact modifier composition which has the dual effects of enhancing the impact strength properties and decreasing the melt viscosity of plastic resins using any known impact modifier. Said impact modifier composition may be prepared by emulsion polymerization, followed by spray drying under the conditions of an inlet temperature of 150 °C, outlet temperature of 55 °C, and rotor speed of approximately 40,000 rpm (claim 18) to obtain a powder. As it is known in the art that the size of the particles resulting from spray drying is dependent in part on the rotor speed, it would have been obvious to one of ordinary skill in the art to optimize the rotor speed through routine experimentation to obtain impact modifier particles of the desired size.

24. Goldman teaches that it is known in the art that stearate-coated calcium carbonate may be added (claim 19) as a flow aid in the isolation of impact modifiers by spray drying. Goldman discloses that stearate-coated calcium carbonate may be added

at higher levels than other flow aids, further improving the flow characteristics of the resulting powder.

25. Fuji, Miyatake, Hamilton, and Goldman are all directed towards the production of impact modifiers. The examiner therefore takes the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Fuji to isolate the impact modifier via a process of spray drying, as taught by Hamilton, using a stearate-coated calcium carbonate flow aid, as taught by Goldman, to develop an economical method of producing an impact modifier powder having improved flow characteristics.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey Lenihan whose telephone number is (571)270-5452. The examiner can normally be reached on Monday through Thursday from 7:30-5:00 PM, and on alternate Fridays from 7:30-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James J. Seidleck can be reached on 571-272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Irina S. Zemel/  
Primary Examiner, Art Unit 1796

Jeffrey Lenihan  
Examiner  
Art Unit 1796

/JL/